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The role of telecommunications operators on smart home service platforms

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Abstract: The formation and evolution of digital service platforms is changing the balance of powers in the ICT industry. In particular, telecommunications operators feel the need to gain more control over the creation and provision of new services and to revise their roles in different service ecosystems. Therefore, both researchers and practitioners call for a better understanding of emerging digital services, such as smart home services, and corresponding platform strategies. Therefore, we assess the roles of leading telecommunications operators on smart home service platforms based on data gathered from in-depth desk research. Drawing on platform theory and the industry perspective on the smart home market, we identify how operators control technological and organizational assets to act as system integrator, enabler, broker and neutral platforms. Further, we discuss operators' strategies and major challenges in establishing common service platforms in a varied smart home ecosystem. Additionally, we point out aspects of interest for further research.

Keywords: smart home, service platforms, business strategy, telecommunications industry

1. Motivation

The formation and evolution of interrelated platforms for digital services, e.g. mobile phone services, is seen as a major phenomenon that fundamentally impacts the business structure of the ICT industry (Gawer, 2009), (Ballon, 2011). Platform leaders control crucial gatekeeper roles in service ecosystems that allow them to determine innovation activity and value capture in the industry as a whole. In the ICT industry, successful platform strategies and ecosystem building change the locus of value creation, internet traffic patterns and the balance of powers among established and new players (Liebenau, 2012), (Ghazawneh, 2013). In particular, telecommunications companies have experienced significant revenue shifts and feel challenged to revise their business models and control digital service platforms (Liebenau, 2012). In this sense, the analysis of platform strategies relevant to the telecommunications industry is becoming increasingly relevant for researchers, practitioners and policymakers (Liebenau, 2012).

At the same time, the market for smart home services is associated with large growth rates and about to become a mass market that offers great potential for value creation and revenue for numerous players from different industries (GSMA, 2011) (PWC, 2013). Smart home services comprise services for automation, health, energy, security and entertainment enabled through ICT that manages devices, systems and networks in the home and connects them to the outside world (Aldrich, 2003) (Solaimani, 2010). In this regard, telecommunications operators are equipped with several technological and organizational assets, such as device and network management, management of customer information, existing billing and support relations with customers, established marketing channels and brands that put them in a favorable position to become platform leaders in the smart home market (Capgemini, 2011) (ADL, 2012). However, depending on the way control over these assets is configured, i.e., devolved to 3rd-parties, platform roles vary and oppose different challenges to intermediaries (Ballon, 2009).

Taking into account above trends and the fact that scholars call for more research on digital platform strategies in the ICT industry (Yoo, 2010) and in the smart home market in particular (Solaimani, 2010) (Nikayin, 2011), this paper analyzes the roles of telecommunications operators on smart home service platforms.

2. Research questions and methodology

In this paper we address the following two research questions and their respective sub-aspect:

- 1) Which platform roles pursue telecommunications operators in the smart home market?
What are the technological and organizational assets underlying these roles?
- 2) What are commonalities and differences in operators' platform strategies?
What are the related key challenges faced by telecommunications?

In order to answer these research questions we review the current smart home positioning of leading telecommunications operators. Information on the cases is obtained from publically available sources including company websites, press articles, conference presentations, and analyst reports.

Our approach is structured in the following way: in the next chapter we introduce the theoretical background on platform theory and present the framework that guides our case study; the subsequent chapter describes the concept of smart homes and the related challenges and opportunities in general and for telecommunications operators in particular; in the chapters 5 and 6 we present and discuss the findings of the case study in reference to the research questions; finally we summarize our work and provide an outlook to further research.

3. Theoretical background

The phenomenon of platforms is subject to research in various academic fields ranging from product development and operation over technology strategy to industrial economics (Gawer, 2009). With each field discussing platforms in a different context, platforms used within a single firm can be distinguished from platforms serving supply-chains, industry ecosystems and multi-sided markets (Gawer, 2009). This paper comprises the latter views, i.e., platforms as intermediaries that facilitate complementary innovation in industry ecosystems or user transactions multi-sided markets. The platform firm controls certain assets commonly used in most user transactions and thus, coordinates relationships within the ecosystem (Baldwin, 2009) (Boudreau, 2009). Companies that pursue a platform strategy may benefit from economies of scale through efficient use of these assets. At the same time, relating their assets to a varied ecosystem of complementary firms allows platforms to evolve and adapt to heterogeneous and changing market environments in a cost-efficient way (Baldwin, 2009).

Further, platforms are bound to network effects, i.e. the value of a platform to a user is dependent on the size and composition of the network of existing users (Gawer, 2009). Reinforcing network effects make platform leadership both hard to establish and hard to stop (Evans, 2010). To initiate a generative ecosystem the platform owner has to “get both sides on board”, or as frequently coined “solve the chicken-and-egg problem”: i.e., a critical mass of users of the platform has to be reached in order to benefit from self-enforcing network effects and achieve a dominant market position. In this regard the tension between “adoption versus appropriability” plays an important role (West, 2003): devolving control over the platform can increase adoption and lead to market dominance through self-enforcing positive network effects. However, it may create competition and foreclose potential monopoly rents (Schilling, 2009). Further, if platforms depend on on-going innovation the trade-off “diversity versus control” has to be considered (Boudreau, 2010). On the one hand, platforms may diffuse architectural control and benefit from diverse external knowledge to appropriately adapt the platform to dynamic environments. On the other hand, knowledge needs to be coordinated in order to avoid platform fragmentation (Schilling, 2009). Therefore, the decision on the right level of control over the platform is crucial as it determines the platform’s chances of survival and long-term profitability (Schilling, 2009) (Eisenmann, 2009).

Platform openness refers to the degree to which participation in and thus, control over the development, use and commercialization of a platform is restricted (Boudreau, 2010) (Eisenmann, 2009). Platform models can be distinguished according to the extent to which control of two principal assets is open to participation: i.e., control over the technological assets that establish the value proposition and on the other hand, control over the customer

relationship (Ballon, 2009) (Eisenmann, 2009). Control over the technology is manifested in the ownership of the technological assets that determine platform’s value proposition (Ballon, 2009). Owners of design and intellectual property rights of the platform technology may change core components, modify usage terms and specify interfaces. This way they are responsible for the evolution of the functional scope of the platform and its ecosystem of complements (Eisenmann, 2009). While technological control assembles the platform’s value proposition, owners of the customer relationship determine the value provision to end users. They deal directly with users serving as their primary point of contact for platform components and complements and mediate user transactions. According to Ballon (2009), four platform models can be distinguished depending on the degree of control over technology and customer relationship as illustrated in Figure 1.

		Control over customer	
		<i>Internal</i>	<i>External</i>
Control over technology	<i>Internal</i>	System integrator e.g., iPhone	Enabler e.g., Intel
	<i>External</i>	Broker e.g., eBay	Neutral e.g., PayPal

Figure 1. Platform typology as proposed by Ballon (2009)

The owner of an enabler platform controls most of the technology, but leaves control over the customer relationship to third-parties. This is opposed to a broker platform on which the platform owner holds the customer relationship, yet, is strongly reliant on the assets of other actors. In addition, a system integrator platform is characterized by an owner that controls both the technology and the customer relationship, while the gatekeeper assets controlled by the owner of a neutral platform are secondary to the value proposition.

4. Industry perspective

A smart home enhances the comfort, convenience, security, entertainment and health of its tenants by anticipating and responding to their needs enabled through information and communication technology managed in the home and connected to the world beyond (Aldrich, 2003) (Solaimani, 2010). The idea of the smart home emerged in the 1970s as facility management tools, like automated heating or light control, were introduced. Around

20 years later the term “smart home” was coined when the concept of building automation was transferred to private homes integrating as well household products and services in the network (Peine, 2009). Since then the smart home has remained a niche market due to various technical, management, conceptual and social barriers, like incompatibility of numerous hardware, software and network technologies, complexity and responsibility issues regarding system administration, misfit to tenants’ changing lifestyles, as well as reliability, privacy and security concerns (Balta-Ozkana, 2013). However, currently, the mass market opportunity for the smart home is driven strongly by several global developments (IBM, 2010) (ADL, 2012): steadily decreasing costs and increasing functionality of consumer devices, sensors and actuators; the digitalization of societies with consumers becoming more receptive of connected products and services; universal connectivity of homes based on the pervasiveness broadband access and the IP protocol. Therefore, a variety of players from different industries, like telecommunication and utility network operators, household and building appliance manufacturers, IT firms and network equipment manufacturers or home automation and control solution specialists, aim for a stake in the growing smart home market (ADL, 2012) (IBM, 2010). However, in order to fully realize the value potential for the mass market and the industry ecosystem, cross-sector collaboration and the establishment of common, industry-independent service platforms are required (Solaimani, 2010) (Nikayin, 2011) (Nikayin, 2012). In this regard, researchers call for platform leaders that possess the technological assets, e.g., accessible enabling functionalities, and organizational assets, e.g., trustworthiness and reputation, and to mobilize a generative ecosystem and create value for customers (Nikayin, 2011).

From a technological perspective, the following components can be considered as the core pillars that determine the value proposition of a smart home offer: devices, communication protocols, services and applications, back-end and front-end service platforms. The devices comprise the hardware that provides specific functionality for the user, like white and brown good home appliances, sensors and actuators, home gateways or remote control devices. Wired or wireless communication protocols connect these devices, i.e., enable them to share information with each other in home networks and with systems and networks that reside outside the home, like the internet. Smart home services and applications build on the functionalities and information provided by connected devices to serve the needs of the occupants regarding a variety of fields, like home security and monitoring, energy management, home entertainment or health support. Back-end and front-end service platforms are combination of hardware architecture, software framework and network infrastructure that integrates devices and communication protocols to host a set of functions that enable the provision of smart home services and applications (Nikayin, 2011). While back-end platforms provide server-centric functions, like device, data or network management, front-end platforms focus on user-centric functions, like device control or information visualization.

In this regard, telecommunications operators own several technology assets that may serve as service platforms and thus, determine the value proposition of smart home services (Capgemini, 2011) (GSMA, 2011) (ADL, 2012). The voice and data networks and integrated IT systems are major operator assets that relate to their strong integration, connectivity, data and device management capabilities. In particular, the broadband internet gateways installed in customers’ homes is capable of connecting various devices. Besides technology assets that drive the value proposition of smart home services, the customer relationships are regarded as

a central organizational asset of telecommunications operators that can facilitate intermediation in a varied smart home ecosystem (GSMA, 2011) (ADL, 2012). Telecommunications operators possess continuous service relationships with millions of households, direct distribution channels and large sale forces including online and retail stores, as well as trusted brands that put them in a favorable position to serve smart home services directly to customers. In addition, such positioning is supported by regular and secure billing relationships as well as first level support relationships with telecommunications operators hold with customers.

5. Case study

In this chapter we present the platform roles of telecommunications operators as identified in the case study analysis. Figure 2 illustrates the analyzed cases and summarizes the findings which are described in detail below.

		Control over customer Marketing & sales, billing, 1 st level support	
		<i>Internal</i>	<i>External</i>
Control over technology Certification of devices, applications and services	<i>Internal</i>	System integrator AT&T	Enabler Deutsche Telekom NTT* Orange* Vodafone* Telecom Italia*
	<i>External</i>	Broker Comcast Rogers Communic. Time Warner Cable Swisscom	Neutral Internet service providers

* Not in commercial use, however, as envisioned by operator

Figure 2. Overview of case study results

Telecommunications operator as broker platform

In this role the telecommunications operator provides smart home services to its customers as the exclusive owner of the customer relationship. The telco-branded offer comprises bundles of connectable devices, a smart home gateway, a user interface and applications to control devices, visualize correspondent information and engage with third-party services. Currently,

typical service domains include home security and monitoring, home automation and energy management. The initial service packages, additional applications, service add-ons and device accessories are provided exclusively through the telecommunications operator's sales channels. Besides the sales relationship, the operator is the first point of contact regarding service provision, customer billing and support. Services of 3rd-party providers, e.g. security service companies, may be integrated in the offer. Likewise compatible devices, sensors and actuators, like control panels, home gateways, surveillance cameras, thermostats, window or door locks, are supplied by different manufacturers and sold through the operator as brand-name or white-label hardware. While the operator owns the customer relationship, the technology that constitutes the core of the value proposition is controlled by a 3rd-party: i.e., a white-label service platform that enables the integration and control of different devices in one central user interface. The operator works closely together with this platform sponsor to decide on the offer's features and define a customized version of the white-label platform. However, the 3rd-party owns the design and intellectual property rights of the service platform that links to an ecosystem of compatible devices and applications. In this sense, the platform sponsor certifies adequate hardware manufacturers that embed the software into their devices and engages in own and 3rd-party application development. A prominent example of such service platform is iControl that has enabled brokerage of smart home services for a range of major telecommunications operators in North America and Europe, like Comcast, Rogers Communications, Time Warner Cable and Swisscom.

Telecommunications operator as enabler platform

In this model the telecommunications company controls a service platform that enables 3rd-parties to build and provide smart home services directly to their customers. Hosted in the operator's cloud infrastructure and in-home gateways the core functionality of this service platform lies in the connectivity and management of smart home devices. In this sense, it constitutes a back-end service platform centered on device administration. While devices, services and applications are provided and owned by 3rd-parties, they undergo a certification process controlled by the telecommunications operator that validates their conformity with the platform interfaces and rules. As such, the operator plays a keystone role in building a generative ecosystem of complementary device and service providers, and thus, determines the way customer value is created and captured. Other than certification and ecosystem building, choices on marketing and sales, customer billing and support are left to the 3rd-parties. This way, the operator does not interfere in the customer relationship, but enables complementary users of its platform, like e.g., utilities companies or white and brown good manufacturers, to extend or establish direct service relationships with the customer. The most prominent example of such a platform model constitutes Deutsche Telekom's Qivicon initiative launched in October, 2013, in the German market. Based on press announcements and publically available presentations of operators, NTT, Orange, Vodafone and Telecom Italia envision the roles of enabler platforms as well.

Telecommunications operator as system integrator platform

In this case, the telecommunications operator controls both the technological assets that establish the value proposition of the smart home services as well as the customer relationship. To assemble the value proposition, the operator works directly with selected service providers, hardware and software suppliers to integrate their services, devices and

applications in its back-end and front-end platforms. The operator then markets and distributes these integrated services and devices directly and exclusively to its customers and provides support services. While such integrated model requires large up-front investments in different technologies and their integration, it allows the telecommunications operator to fully control the delivery of the value proposition from end-to-end. E.g., currently, AT&T's Digital Life platform represents such an integrated approach with a home monitoring and security service proposition at its core. The value proposition builds on the acquisition of a specialized smart home service provider, investments in its own certified monitoring centers and strategic partnerships with device and network equipment manufacturers. Tight control of core technology assets and service quality as well as exploitation of existing marketing and sales channels have positioned AT&T as a leading security service provider in the US market.

Telecommunications operator as neutral platform

As a neutral platform the telecommunications operator is neither the owner of customer relationship nor the sponsor of a technological architecture that defines value creation and delivery in the smart home ecosystem. The telecommunications operator acts as an internet service provider that facilitates access and traffic management to service providers and their customers independent of their affiliation with the smart home market. In this sense, the operator represents a neutral intermediary that exploits its network infrastructure to provide connectivity services that are not tight to a particular type of end customer service, like smart home services. This role model results from the fact that smart home services can be provided over the top of wired and wireless access networks, i.e. their availability is agnostic of the broadband access provider. At the same time, there are smart home services that may demand certain quality levels of internet access and data transport services, e.g., remote health care or monitoring services. In this case, telecommunications operators can serve as an intermediary for differentiated data transport exploiting their Quality-of-Service capabilities.

6. Discussion

The case study demonstrates that all 4 platform roles are played by telecommunications operators in the smart home market. The technological and organizational assets that demarcate these role models include direct marketing and sales channels, billing and 1st level support relationships with the customer (customer ownership) as well as control over the technologies that determine the value proposition in the smart home ecosystem, i.e., the certification of connected devices, applications and services (technology sponsoring). System integrators are both customer owners and technology sponsors, while brokers and enablers assume control only of the former and latter assets respectively. Neutral platforms have no control over above platform assets. Further, we find that several operators, including AT&T, Deutsche Telekom, Orange, NTT, Telecom Italia envision the role of providing common service platforms for numerous 3rd-party service providers across different industries as called for by Nikayin (2011). This imposes the challenge to provide effective incentives for supply-side platform adoption and to build generative ecosystems – which operators address in different ways as discussed in the following.

First, Deutsche Telekom placed Qivicon from the start as an initiative that includes multiple partners, e.g., a major German utility company, globally leading white and brown good

manufacturers and home automation specialists, to offer both own services and 3rd-party services at its launch. This is opposed to the approach struck by AT&T that has launched its own narrow service offering, i.e., home monitoring and security, before announcing a partner program to allow entry of 3rd-party services. A similar roadmap is envisioned by Orange that recently launched its own smart home services in Poland with France being the next market this summer, while envisioning to certify 3rd-party services and devices afterwards. The decision on how collaborative versus how competitive the relationship with complementors is has major impact on the platform success (Gawer, 2002). In this sense, telecommunications operators embrace different levels of positioning their own services and competing with 3rd-parties.

Second, we find that telecommunications operators embrace different strategies regarding the scope and internal organization of the platform. The assets of platform owners determine the functional scope of the platform, while the internal organization influences how effectively conflicts of interest can be managed (Gawer, 2002) (Eisenmann, 2007). For example, in 1999 Palm spun off Palm Inc. to separate the company licensing the Palm OS from the company manufacturing the handheld devices (Gawer, 2002). While AT&T's brand is prominent on its Digital Life platform, Deutsche Telekom decided to brand its smart home initiative without reference to the operator. Further, while both ventures are owned by the telecommunications operators, Vodafone has announced a joint initiative with IBM (IBM, 2012). Based on the available information, it seems likely that this joint initiative is envisioned as a joint venture as in the case of Cisco, Bosch, LG and ABB (Cisco, 2013).

Third, in order to build generative ecosystems around their platforms operators (plan to) establish partner and certification programs to support on-boarding of 3rd-party services and devices. In addition, the operators have announced to launch software development kits. In the case of Qivicon, the platform is affiliated with developer partners that help 3rd-party service and device providers with the creation and launch of their own smart home offers. While these measures aim to reduce the costs for 3rd-party integration and application development, they document the challenge of defining and exposing standardized, well documented and maintained application programming interfaces (APIs) – a competency with which telecommunications operators have struggled in the past, e.g., regarding mobile and cloud service platforms (Stanoevska-Slabeva, 2010) (Goncalves, 2011). In this sense, platform success strongly depends on telecommunications operators capabilities in API exposure, especially since players that have demonstrated such capabilities recently entered the market, like Google and Apple (Google, 2014) (Apple, 2014).

7. Conclusion and outlook

In this paper we analyzed the platform roles of telecommunications operators in the smart home market based on multiple case studies. We identified and described the telecommunications operators' roles as system integrator, enabler, broker and neutral platforms as well as the configuration of control over the strategic assets that define these roles. Further, we highlighted commonalities and differences in the way operators address key strategic challenges of platform leadership. Building on these challenges interesting fields of further research include the evolution of operators' relationships with 3rd-party service providers regarding collaboration and competition, the factors that influence decisions on

platform scope and organization as single or joint ventures, as well as operators' efforts in opening and maintaining standardized application programming interfaces.

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